Module Details

Module Code:	COMP I8004
Full Title:	Data Centre Infrastructure APPROVED
Valid From::	Semester 1 - 2019/20 (June 2019)
Language of Instruction:	English
Duration:	1 Semester
Credits::	5
Module Owner::	Peadar Grant
Departments:	Unknown
Module Description:	Current trends including expansion of data collection, continued growth of e-Commerce and the large scale adoption of cloud computing have fuelled the need for scalable computing density, efficiency and reliability. Data centres have become a critical component in fulfilling these needs in centralised, onsite and edge locations. This module introduces concepts in the data centre infrastructure and goes through the stack from building facilities to service delivery covering key technologies, operations, standards and management best practices.

Module Learning Outcome	
On successful completion of this module the learner will be able to:	
#	**Module Learning Outcome Description**
MLO1	Conduct data centre space planning and energy calculations
MLO2	Evaluate contrasting data centre cooling techniques, fire suppression and security provisions.
MLO3	Design data centre networking infrastructure to provide segmentation, scalability, monitoring and lights-out management.
MLO4	Incorporate professional standards into Data Centre Infrastructure Management (DCIM).

Pre-requisite learning
Module Recommendations   *This is prior learning (or a practical skill) that is strongly recommended before enrolment in this module. You may enrol in this module if you have not acquired the recommended learning but you will have considerable difficulty in passing (i.e. achieving the learning outcomes of) the module. While the prior learning is expressed as named DkIT module(s) it also allows for learning (in another module or modules) which is equivalent to the learning specified in the named module(s).*
No recommendations listed

Module Indicative Content

Introduction
History of data centres, Overview of critical services, Data centre design, Types of data centre architecture, Business needs as a driver, Geographic location as a consideration. European and regional standards, legal requirements and emerging community standards: EU CoC, LEED, BREEAM & IDCA, Emerging trends

Electrical Power Systems
Basics of electricity, AC and DC power solutions, Power quality, ITIC/CBEMA Power Quality Curve, Power distribution within a data centre. Calculation of Power Factor, UPS technology, Managing UPS capacity, Standby/backup power, European and regional standards, codes and regulations for electricity, Maintenance and scalability, Risk Management, Monitoring and control strategies, Renewable power and future trends.

Cooling and Fire Suppression
Basics of cooling, cooling options, Monitoring and control strategies, Global, European and regional standards: ASHRAE, Efficiency of cooling systems CoP/EER, Heat re-use, Design considerations, hot aisle/cold aisle setup, Air management, Raised Flooring, Liquid cooled servers, Risk Management, Monitoring and control strategies, Emerging trends in cooling and environmental control systems. Fire regulations, Fire prevention strategies, Fire detection, fire suppression: including water, water-mist & gaseous suppressants, Case Studies.

Physical and Logical Security
Security plan considerations, Physical security policies, Logical security policies, Data protection, Decommissioning equipment, Regulations and standards, Monitoring and control strategies.

Infrastructure Management
Facilities management, BMS and EMS, Integrated systems and interfaces, Monitoring and reporting systems for services using tools such as Nagios and Zabbix, Server configuration management using tools such as ansible and chef. Drivers in infrastructure management, DCIM technology, Infrastructure moves, adds and changes, Documentation, Future trends.

IT and Network Infrastructure
Data Centre network cabling, Cabling standards TIA/EIA-942, Structured cabling, Twisted pair copper cable and fibre cable standards, UTP and STP, Cable containment methods best practices: instillation and daily operations, network topology, bandwidth requirements, Considerations for server deployment and virtualisation, Redundancy, Failover, scalability and emerging trends, Network traffic monitoring using tools like MRTG, Case studies, field visit to a range of Data Centres.

Module Assessment

Assessment Breakdown	%
Course Work	60.00%
Final Examination	40.00%

Module Special Regulation

Assessments

Full Time On Campus

Course Work			

Assessment Type	Written Report	% of Total Mark	30
Marks Out Of	0	Pass Mark	0
Timing	Week 6	Learning Outcome	2,4
Duration in minutes	0		

Assessment Description
Field Visits - Case study/Written Report on Data Centre Infrastructure Management

Assessment Type	Continuous Assessment	% of Total Mark	30
Marks Out Of	0	Pass Mark	0
Timing	End-of-Semester	Learning Outcome	1,2,3,4
Duration in minutes	0		

Assessment Description
Assignment to assess key concepts of space planning, monitoring, power, efficiency and failover.

No Project

No Practical

Final Examination			

Assessment Type	Formal Exam	% of Total Mark	40
Marks Out Of	0	Pass Mark	0
Timing	End-of-Semester	Learning Outcome	1,2,3,4
Duration in minutes	120		

Assessment Description
End of Semester closed book exam

Part Time On Campus

Course Work			

Assessment Type	Written Report	% of Total Mark	30
Marks Out Of	0	Pass Mark	0
Timing	Week 6	Learning Outcome	2,4
Duration in minutes	0		

Assessment Description
Field Visits - Case study/Written Report on Data Centre Infrastructure Management

Assessment Type	Continuous Assessment	% of Total Mark	30
Marks Out Of	0	Pass Mark	0
Timing	End-of-Semester	Learning Outcome	1,2,3,4
Duration in minutes	0		

Assessment Description
Assignment to assess key concepts of space planning, monitoring, power, efficiency and failover

No Project

No Practical

Final Examination			

Assessment Type	Formal Exam	% of Total Mark	40
Marks Out Of	0	Pass Mark	0
Timing	End-of-Semester	Learning Outcome	1,2,3,4
Duration in minutes	120		

Assessment Description
End of Semester closed book exam

Reassessment Requirement

A repeat examination
Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.

Module Workload

Workload: Full Time On Campus

Workload Type	Contact Type	Workload Description	Frequency	Average Weekly Learner Workload	Hours
Lecture	Contact	1x 1h lecture per week	Every Week	1.00	1
Practical	Contact	1x 2h practical per week	Every Week	2.00	2
Directed Reading	Non Contact	-	Every Week	3.00	3
Independent Study	Non Contact	-	Every Week	2.00	2
				Total Weekly Learner Workload	8.00
				Total Weekly Contact Hours	3.00

Workload: Part Time On Campus

Workload Type	Contact Type	Workload Description	Frequency	Average Weekly Learner Workload	Hours
Lecture	Contact	1x 1h lecture per week	Every Week	1.00	1
Practical	Contact	1x 2h practical per week	Every Week	2.00	2
Directed Reading	Non Contact	-	Every Week	3.00	3
Independent Study	Non Contact	-	Every Week	2.00	2
				Total Weekly Learner Workload	8.00
				Total Weekly Contact Hours	3.00

Module Resources

Recommended Book Resources

Jim Harrison. (2012), KS18 Data Centres: An Introduction to Concepts and Design, Chartered Institution of Building Services Engineers, [ISBN: 9781906846244].

This module does not have any article/paper resources

Other Resources

Website, ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers. Homepage,
https://www.ashrae.org/

Website, International Datacentre Authority,
https://www.idc-a.org

Website, The Open Compute Project,
http://www.opencompute.org/

Website, European Commission. Code of Conduct for Energy Efficiency in Data Centres,
https://ec.europa.eu/jrc/en/energy-effic iency/code-conduct/datacentres

Website, BRE Group. BREAM - sustainability assessment method for projects, infrastructure and buildings,
http://www.breeam.com/

Website, US Green Building Council. LEED - Leadership in Energy and Environmental Design,
http://www.usgbc.org/leed

Website, Nagios - Opensource IT Infrastructure Monitoring,
https://www.nagios.org/

Website, Zabbix - Enterprise-class Monitoring Solution,
http://www.zabbix.com/

Website, Network Admins' Favorite Monitoring Tools,
https://www.mrtg.com/